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**Abstract of the Disclosure**

Carbon nanotube field effect transistors, arrays of carbon nanotube field effect transistors, device structures, and arrays of device structures. A stacked device structure includes a gate electrode layer and catalyst pads each coupled electrically with a source/drain contact. The gate electrode layer is divided into multiple gate electrodes and at least one semiconducting carbon nanotube is synthesized by a chemical vapor deposition process on each of the catalyst pads. The gate electrode has a sidewall covered by a gate dielectric and at least one semiconducting carbon nanotube adjacent to the sidewall of the gate electrode. Source/drain contacts are electrically coupled with opposite ends of the semiconducting carbon nanotube to complete the device structure. Multiple device structures may be configured either as a memory circuit or as a logic circuit.